

Delaware. It was noted in the greatest number of states and territories, twenty-eight, on the 9th; in twenty-six on the 8th; in nineteen on the 28th; in eighteen on the 29th; in seventeen on the 7th, 10th, and 20th; in sixteen on the 21st; in from ten to fifteen, inclusive, on the 6th, 15th, 27th, 30th, and 31st; in from five to nine, inclusive, on the 1st to 5th, 11th to 14th, 16th to 19th, 22d, 23d, and 26th. On the 24th and 25th no snow was reported.

The southern limit of snow is represented by a line traced from Norfolk, Va., westward to Wichita, Kans., and thence southward into Texas to about latitude N. 33°, whence it trends westward to south-central Arizona, from which locality it is continued northwestward into California east of Sacramento. To the northward of the fortieth parallel the line indicating the snow limit over the western part of the country curves southeastward over the plateau region of the Rocky Mountains forming an elongated area, within which no snow was reported, extending from Washington and the northeastern part of Oregon to western Colorado.

The heaviest snowfall for the month, east of the one hundred and twentieth meridian, was reported within an area extending from central Vermont westward into north-central New York, where it exceeded twenty-four inches, the greatest depth, thirty-six inches, being noted at Strafford, Vt. A monthly snowfall of twenty-four inches was also reported at Sault de Ste. Marie, Mich. At Summit, Cisco, and Emigrant Gap, Cal., a depth of 95.5, 94.0, and 29.0 inches, respectively, was reported. The snowfall exceeded twelve inches over the northern half of New Hampshire and Vermont; generally over New York, north of the forty-third parallel; within a limited area in east-central Pennsylvania, and at stations in extreme northern parts of Michigan.

#### DEPTH OF SNOW REMAINING ON GROUND ON 15TH AND AT CLOSE OF MONTH.

Except within two areas, one embracing a greater part of New York, Vermont, and New Hampshire, west-central and southeastern Maine, and the other extending over central Minnesota, and at a station in west-central Nevada, no snow was reported on the ground on the 15th. The greatest depth, twenty-four inches, was noted at Palermo, N. Y. In Minnesota the greatest depth was reported in the vicinity of Lake Winnibigoshish, where it varied from five to eight inches. At Wellington, Nev., a depth of five inches was noted.

Chart v shows that at the close of the month snow was reported on the ground over a greater part of New England, New York, eastern and central Pennsylvania, northern New Jersey, and the Lake region, and that the greatest depth was noted at stations in north-central New Hampshire and Vermont, and central New York, where twenty inches or more were reported. For the extreme northern part of the upper peninsula of Michigan a depth of twelve inches is indicated.

#### MONTHLY SNOWFALLS (inches and tenths) MARCH, 1889.

Below are given all monthly snowfalls of five inches, or more, and in states and territories where the maximum depth was below that amount, the station reporting the greatest is given: *Arizona*.—Williams, 5.5. *California*.—Summit, 95.5; Cisco, 94; Emigrant Gap, 29; Towles, 6. *Colorado*.—Fort Lewis, 9.5; Leadville, 9; Georgetown, 8.5; Idaho Springs, 7.3; Breckenridge and Grand Lake, 7; Coulter and Palmer Lake, 6. *Connecticut*.—New Hartford, 5.4; Mansfield, 5. *Dakota*.—Webster, 6.2; Fort Meade, 5.6. *Delaware*.—Newark, trace. *District of Columbia*.—Washington City, 0.5. *Illinois*.—Winnebago, 8.5; Lake Forest, 8; Belvidere, 7.5; Rockford, 7; Lanark, 6.8; Sycamore, 6.5; Riley, 6.2; Aurora, 5.7; Chicago, 5.1; Mount Morris and Rock Island Arsenal, 5. *Indiana*.—Angola, 2. *Indian Territory*.—Fort Sill, 0.4. *Iowa*.—Clinton, 4.5.

*Kansas*.—Junction City, 3.8. *Kentucky*.—Mount Sterling, 2.5. *Maine*.—Mayfield, 14; Bar Harbor, 6; Portland, 5.4. *Maryland*.—Barren Creek Springs, 1.8. *Massachusetts*.—Williamstown, 11.3; Royalston, 6.2. *Michigan*.—Sault de Ste. Marie, 24; Calumet, 14; Pulaski, 9; Marquette, 8.4; Jeddo and Lansing, 8; Port Huron, 7.7; Berlin, 7.4; Hastings, 7.3; Atlantic, Flint, Hanover, Ovid, and Pontiac, 7; Saint John's and Thornville, 6.5; May and Traverse City, 6; Lothrop, 5.7; Ypsilanti and Fort Wayne, 5.2; Eden, Fremont, and Washington, 5. *Minnesota*.—Pokegama Falls, 9.2; Farmington, 6; Duluth, 5.9; Lake Winnibigoshish, 5.8; Leech Lake, 5.7. *Missouri*.—Sedalia, 4. *Montana*.—Fort Maginnis a and Sheldon, 8; Fort Maginnis b, 7.2; Fort Assinaboine, 6.1; Virginia City, 6; Helena, 5. *Nebraska*.—Hay Springs, 3.7. *Nevada*.—Wellington, 12; Pioche and Tuscarora, 6.5. *New Hampshire*.—Berlin Mills, 16.5; North Sutton, 9; Nashua, 7.5; North Chesterfield, 7; Manchester, 6.4; Antrim, 6. *New Jersey*.—Atlantic City, 7.3. *New Mexico*.—Santa Fé, 5.6. *New York*.—Saranac Lake, 26; Number Four, 24; Palermo, 23; Hess Road Station, 22.4; Lyons, 20; Utica, 17.7; Rochester, 17.5; Barnes' Corners, 16; Potsdam, 15.5; Oswego, 14.4; Somerset, 13.5; Fort Porter, 13.2; Ilion, 12.6; Constableville, 12; New York City, 11; Salem, 10.8; Lowville, 10.5; Fort Wadsworth, 10.2; Le Roy, 9.1; Fort Niagara and Ithaca, 9; Buffalo, 8.9; North Hammond, 8.7; Canton, 8.6; Friendship and Humphrey, 8.5; David's Island, 8.3; Fort Schuyler and Nineveh, 8; Angelica, 7; Perry City and Tannersville, 6.5; Cooperstown, 5.8; Queensbury and Wedgewood, 5.2; Geneva and South Canisteo, 5. *Ohio*.—Cleveland, 6.1. *Oregon*.—Siskiyou, 5. *Pennsylvania*.—Bloomington Grove, 13; Charlesville, 11.5; Eagle's Mere, 9.6; Pleasant Mount, 9.5; Germantown and Girardville, 8; Somerset, 7.8; Uniontown, 7.5; Drifton, 7.2; Grampian Hills, 7; Salem Corners, 6.3; Allegheny Arsenal and Le Roy, 6.1; Rimersburgh, 6; Dyberry, 5.5. *Rhode Island*.—Woonsocket, 6. *Texas*.—Fort Elliott, 3.9. *Utah*.—Fort Douglas, 2. *Vermont*.—Strafford, 36; East Berkshire, 25.9; Lunenburg and Burlington, 17.5; Northfield, 14; Saint Johnsbury, 7. *Virginia*.—Bolar, 1. *West Virginia*.—Middlebrook, 22.5; Hartmontsville, 9; Rockport, 7. *Wisconsin*.—Summit Lake, 8.5; Delavan, 8.2; Fond du Lac, 6; Manitowoc, 5.2. *Wyoming*.—Camp Sheridan, 1.8.

#### HAIL.

Descriptions of the more severe hail-storms of the month are given under "Local storms." Hail was reported during the month as follows:

4th, Pa. 7th, Ind., Iowa, N. H. 8th, Cal., Nev., Ohio, Oregon. 9th, Wash. 10th, Ariz. 13th, Cal., N. H., Oregon. 14th, Ariz., Cal. 15th, Ariz., Ark., Cal., Iowa, Mo., N. J., N. Y. 16th, Cal., La., Tenn. 17th, Conn., Iowa, Mass., N. H., Ohio. 18th, Ill., Ky., Mo., N. H., N. Y., Oregon, Tenn. 19th, Ky., N. C., S. C., Tenn. 20th, Ind. T., Mass., Oregon, R. I. 21st, Ariz., Mass., N. Y., R. I., Tex. 22d, Colo., Tex. 23d, Oregon. 24th, Ga., Miss., S. C. 25th, Minn. 26th, S. C. 27th, N. Y., Tex. 28th, Iowa, Md., Mass., N. H., N. J. 30th, Dak., Ill., Iowa, Kans., Mass., Mich., Mo. 31st, Ill., Iowa, Md., Mass., Mo., N. J., N. Y., Ohio, Pa., Tex.

#### SLEET.

Sleet was reported during March as follows: 1st, Ind., Ohio, Minn. 2d, Miss., Ohio. 4th, Mass. 5th, Ill., Iowa, Ohio, W. Va. 7th, Iowa, Ohio. 8th, Ind. 9th, Kans. 10th, Tex. 14th, Dak., Mich., Minn., Nebr. 15th, Dak., Iowa, Mich., Minn., Nebr., Nev. 16th, Conn., Minn. 17th, Me., Mass., Vt. 19th, Utah. 20th, Conn., N. Y. 21st, Conn., N. Y., Ohio, R. I. 26th, Wis. 27th, Ky. 28th, Conn. 29th, Mich., N. Y., Ohio. 30th, Dak., Ill., Iowa, Mich., Minn. 31st, Conn., Dak., Ind., Mass., Mich., N. J., N. Y., Ohio, Pa.

#### WINDS.

The prevailing winds during March, 1889, are shown on south Atlantic states, Florida, the upper Mississippi valley, chart i by arrows flying with the wind. In New England, the and the northeastern, middle, and southeastern slopes of the

Rocky Mountains north to west winds were most frequently noted. In the middle Atlantic and east Gulf states, the lower Mississippi, Ohio, and Missouri valleys, Tennessee, and the lower lake region they were mostly from the northwest. In the west Gulf states and on the north Pacific coast variable; in the upper lake region, northerly, and in the plateau regions of the Rocky Mountains, and on the immediate Pacific coast south of the fortieth parallel, from southwest to northwest.

#### HIGH WINDS (in miles per hour).

Maximum velocities of fifty miles, or more, per hour, other than those given in the table of miscellaneous meteorological data, have been reported as follows: Block Island, R. I., 57, ne., 5th; 52, ne., 15th; 60, ne., 17th; 60, ne., 20th; 62, ne., 21st. Hatteras, N. C., 53, n., 15th; 52, n., 28th. Fort Canby, Wash., 50, s., 18th. Tatoosh Island, Wash., 50, e., 7th.

#### LOCAL STORMS.

The following description of storms generally refer to disturbances which attended the passage of areas of low pressure traced on chart i:

**13th. Michigan.**—Sault de Ste. Marie: high northwesterly wind began 4.15 a. m.; it attained the velocity of a gale at 7.40 a. m. and continued twelve hours; maximum velocity, thirty-four miles per hour from the northwest; signs were blown down and telegraph and telephone wires were damaged by the wind.

**14th. Georgia.**—Savannah: light rain fell all day. The wind blew at the rate of about thirty-six miles per hour from the northwest most of the afternoon, and attained a maximum velocity of forty-six miles per hour, blowing down limbs of trees, chimneys, signs, etc.

**14th and 15th. Virginia.**—Cape Henry: a gale from the northeast began 12.35 p. m., 14th; it increased steadily in force from 2 p. m. through the night and following day, attaining a maximum velocity of seventy-two miles per hour from the northeast on the 15th. The brigantine "Agnes Barton" was blown ashore and wrecked during the storm.

**15-16th. Virginia.**—Norfolk: a severe storm prevailed. The wind attained its maximum velocity, thirty-five miles per hour, at 12.30 a. m., 15th. A large number of vessels were wrecked or otherwise damaged and several persons were drowned during the gale.

**18th. Tennessee.**—Dayton: this city was visited in the evening by the heaviest rain and thunder-storm ever known here. The waters of Richland Creek, which runs through the city were so swollen that the fires in the furnaces were put out. A mile and a half of railroad was washed out and great damage done to other property. The loss in this vicinity

is estimated at \$16,000—*The Daily American, Nashville, Tenn., March 20th.* Chattanooga: a thunder-storm began 6.33 p. m. and ended 11.55 p. m.; heavy rain falling for about two hours and light rain continuing until after midnight. The sewers being inadequate to carry off the water, some streets in the city were flooded. Hail occurred for five minutes during the storm, the stones being as large as a medium-sized marble, breaking a number of skylights and window panes.

**19th. North Carolina.**—Wilmington: the hail and thunder-storm in the evening was very severe in the northern section of the city. At the Wilmington Compress building nearly all the glass in the skylights was broken, and the hail drifted in places to a depth of twelve inches; the hail also caused much damage to plants and shrubbery. Beyond the city limits north and west the storm was still more severe. At Navassa Guano Works one hundred and fifty panes of glass were broken and the drifts were three feet deep.—*The Morning Star, Wilmington, March 21st.*

**21st. Texas.**—Fort Clark: a terrific hail storm with lightning and high wind passed over this place from the north at 10 p. m.; stones the size of pigeon eggs, and some larger, fell. An enormous quantity of fish, estimated at several wagon loads, were found dead on the banks of Las Moras Creek after the storm. The crops in the company gardens were destroyed.—*Report of United States Army post surgeon.*

**30th. Iowa.**—Davenport: a severe thunder-storm, accompanied by sharp lightning, hail, heavy rain, and high south-east wind, with a maximum velocity of thirty-two miles per hour, occurred in the afternoon; the wires of the electric light company were shattered by lightning and the light extinguished; the storm also caused a delay of several hours to the electric cars in this city. A furniture factory was struck by lightning and the building set on fire; loss \$20,000.

**31st. Kentucky.**—Lexington: light rain fell at intervals during the day and a severe gale from the southwest began 11 a. m., attaining a maximum velocity of sixty-two miles per hour, which is the highest wind velocity recorded here since the establishment of the Signal Service station in 1887. **Texas.**—Hico, Hamilton Co: a storm about twenty feet in width, and moving in a northeasterly direction, passed about one mile west of this town between 2 p. m. and 3 p. m. One house in its path was twisted and hurled about, and a rock chimney standing between two rooms fell, killing two children and injuring others. After passing this point the storm disappeared. It is reported that a cloud-burst occurred about two miles northwest of this place a few minutes after the storm had passed, and that about twelve inches of rain fell in a few minutes.—*Reported by Mr. J. C. Rodgers.*

### INLAND NAVIGATION.

#### ICE IN RIVERS AND HARBORS.

**Connecticut River.**—New London, Conn.: the river was open to navigation on the 6th; it has been one of the shortest ice seasons in the history of the river.—*New London Telegraph, March 6th.*

**Hudson River.**—Albany, N. Y.: the first boat of the season, from New York City, arrived here on the 21st.

**Oswego River.**—Oswego, N. Y.: the ice passed out of river very rapidly on the 17th and 18th, and the river and harbor were free of ice on the 19th, but filled up on the following day; it passed out again on the 24th.

**Niagara River.**—Buffalo, N. Y.: floating ice in river 11th, 13th, 23d, 25th, and floating ice in harbor, 22d, 23d, 25th.

**Maumee River.**—Toledo, Ohio: the ice in river broke and passed out into the lake on the 12th; the river was nearly free of ice the following day, and open to navigation on the 17th.

**Beaver Creek.**—Pittsburgh, Pa., 5th: the new bridge across the creek at Fallston, about one mile above Rochester, Pa., is in danger of being carried away by an immense gorge of ice.

The ice has formed a regular dam at the bridge, and every hour tons are being added to the weight.—*New London Telegraph, March 6th.*

**Black River.**—Port Huron, Mich.: the river was free of ice on the 16th.

**Pine River.**—Saint Clair, Mich.: the ferryboat "Clara" began her regular trips on the 6th, after having been laid up one month.—*Saint Clair Republican, March 7th.*

**Thunder River.**—Alpena, Mich.: the river and bay were clear of ice on the 19th.

**Saginaw River.**—The ice was moving out of the river on the 14th. A narrow bridge of thin ice at the foot of Lake Huron was all the ice perceptible from Fort Gratiot, clear water appearing as far as the eye could reach.—*Buffalo Courier, March 16th.*

**Grand River.**—Grand Haven, Mich.: the river was almost clear of ice on the 5th, and vessels can now enter and leave the port without difficulty.

**Saint Clair River.**—Detroit, Mich.: the steamer "R. G. Stew-